

### SCH 3U1 Assorted Review Questions

1. The following 3 values for the density of water were determined by experiment:  
0.99 g/mL, 1.04 g/mL, & 0.94 g/mL. These values are accurate but not precise ( true or false )
2. How many significant digits are in a) 200 152 ..... 1.0040 x 10<sup>6</sup> ..... 0.0048 ..... 7.0 .....
3. 18.987 g / 3.06 = ..... which has ..... significant digits
4. What is an example of a **physical property** of matter .....
5. What is an example of a **chemical property** of matter .....
6. What is an example of a **physical change** .....
7. What is an example of a **chemical change** .....
8. What is an example of a quantitative property of matter .....
9. A group of students collected the following data about a piece of aluminum foil  
length = 10.0 cm, width = 7.5 cm, mass = 7.091 g, density = 2.70 g/cm<sup>3</sup>  
What is the thickness of the foil ? ..... Which measurement determines its precision ? .....
10. If a **mixture** has only **one phase** it is said to be ..... **2 phases** ? .....
11. Air is classified as a ..... because its composition is .....
12. Isotopes of the elements contain different numbers of .....but the same # of ..... & .....
13. An **alpha particle** contains ..... protons & ..... neutrons and weighs ....., symbol = .....
14. the nucleus <sup>209</sup><sub>82</sub>Pb emits an alpha particle. Write this nuclear reaction eq'n:.....
15. When an isotope emits a **beta particle** the atomic# of the substance .....& the at mass .....
16. The nucleus <sup>209</sup><sub>82</sub>Pb emits a beta particle. Write this nuclear reaction eq'n: .....
17. A 100 g sample of a radioactive substance decayed to 3.125 g in 300 days. What is the **1/2 life** of this sub? .....
18. The isotope cobalt-60 ( <sup>60</sup><sub>27</sub>Co ) has ..... protons & ..... neutrons in its nucleus with ..... electrons around it
19. The isotopic ion <sup>56</sup><sub>25</sub>Mn<sup>2+</sup> has..... protons & ..... neutrons in its nucleus with ..... electrons around it.  
The electron configuration for these electrons would be 1s<sup>2</sup>.....
20. Write the e<sup>-</sup> configuration for phosphorus .....
21. Write the e<sup>-</sup> configuration for copper .....
22. Group VIA elements have ..... valence electrons, group III elements ? .....
23. If arsenic acid is H<sub>3</sub>AsO<sub>4</sub>, what is the formula of calcium arsenate.....
24. What is the chemical formula for a) perchloric acid ..... b) mercuric nitrate ..... c) oxygen gas .....  
d) iron(III) sulfate ..... e) dinitrogen tetroxide ..... f) ammonia gas ..... g) magnesium phosphate .....
25. Write the formula of the hydrated salt ; dialuminum hexachloride octahydrate .....
26. Potassium chromate ( ..... ) is ..... % **by mass** chromium
27. Determine the **empirical**(simplest) **formula** of an organic compound that was 75% Carbon & 25% Hydrogen .....
28. A compound is 52.2 % C, 13.0 % H and 34.8 % O by mass. Its vapour has a density of 2.05 g/L at STP. What is the structural formula for the comp
29. The amount of product that is predicted is called the ..... yield, the actual amount obtained is ..... yield
30. If you separated a 62 g mixture of sand/salt and recovered 60 g, what was your % yield ? .....
31. What is the name given to a homogeneous mixture of 2 or more metals .....
32. Write (aq) beside the soluble substances and (s) beside the insoluble substances  
(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub> ..... PbCl<sub>2</sub> ..... Ba(OH)<sub>2</sub> ..... AgC<sub>2</sub>H<sub>3</sub>O<sub>2</sub>..... Ca<sub>2</sub>3(PO<sub>4</sub>)<sub>2</sub>..... HgClO<sub>4</sub> ..... K<sub>2</sub>CO<sub>3</sub>..... Cu(NO<sub>3</sub>)<sub>2</sub>.....
33. Compounds which exhibit colour are generally associated with the..... elements
34. A solution that is blue probably contains the ..... ion, green ?? .....
35. A flame that is pinkish/purple in colour probably has the .....ion in it. yellow-orange ?? .....
36. As one proceeds from the left to the **right** in the PT the atomic **size**..... **down**?? .....  
from the left to the **right** the **Ionization Energy**..... **down a family** ?? .....
37. Relative **electronegativity**..... down a family and..... across a period
38. A molecule that has 120° bond angles has a ..... shape
39. The boron trifluoride molecule has a ..... shape

40. Carbon tetrachloride has a .....shape with ..... bonds yet the molecule is not .....
41. A molecule of  $\text{CN}^-$  has how many lone pairs of electrons ? .....
42. Molecules with bond angles of  $109^\circ$  can have ..... or ..... or ..... shapes
43. .... is an example of a polar molecule.
44. The bonds between water molecules in solid ice are called ..... bonds
45. The bonds between carbon dioxide molecules in solid “dry” ice are called ..... bonds
46. List an example of **non-polar** molecular solid ....., **3-dimensional network** solid .....
47. a) this solid type is a good conductor, deformable & a mid MP.....  
b) this solid type is a poor conductor, brittle & a high MP .....
48. The gas phase rx  $\text{HCl} + \text{Br} \rightarrow \text{Cl} + \text{HBr}$  is **endothermic**, this implies that the H-Cl bond is (*stronger / weaker*) than the H-Br bond.
49. The temperature of a substance is related to the average..... energy of that chemical substance.
50. Charles’ Law taught us to measure our temperatures in .....,  $0^\circ \text{C} = \dots\dots\dots \text{K}$ ,  $25^\circ \text{C} = \dots\dots\dots \text{K}$
51. The..... phase has neither a definite volume nor a definite shape.
52. The universal gas constant, R, has a value of ..... and used in the equation.....
53. Avogadro’s Hypothesis=.....
54. a) What is the STP volume of  $6.0 \times 10^{21}$  molecules of hydrogen gas .....  
b) What is the volume of **8 g** of hydrogen gas at  $-20^\circ \text{C}$  and 1200 kPa .....
55. a) What is the mass of  $6.0 \times 10^{21}$  molecules of neon gas .....  
b) What mass of neon gas is in a 160 L sign if at  $10^\circ \text{C}$  the pressure is 3 kPa .....
56. Living cells contain..... called enzymes.
57. a) Hydrogen peroxide decomposes quickly when a..... like ..... is added to it  
b) When potassium chlorate is heated with a catalyst ..... gas is produced
58. a) when metals react with oxygen gas they produce ..... in a process called .....  
b) Metal oxides react with water to produce ..... non-metal oxides produce .....
59. Oxidation to a chemist means .....
60. When  $\text{C}_{16}\text{H}_{26}\text{S}_2\text{N}_2$  burns ..... + ..... + ..... + ..... are produced
61. Which group on the P.T. react most vigorously with water .....
62. a) When the metals react with acids ..... gas is produced. The  $\text{H}^+$  was ..... to  $\text{H}_2$   
b).What test is used to identify hydrogen gas .....
63. Where are the most reactive metals on the PT? ..... why ? .....
64. Give an example of a metal that does not oxidize in the presence of an acid.....
65. What must the pH be for an ammonium compound to decompose into ammonia gas .....
66. Chemists rely on ..... or ..... or..... to persuade slow rxns to work
67. A reaction that involves mixing 2 salt solutions together is called .....
68. When carbonates react with acids ..... gas is produced
69. The reactant that is completely used up in a chemical reaction is the ..... & then the rx .....
70. If 4.15 mol of oxygen react with 5.65 mol of aluminum, the limiting reagent is .....
71. If 5.2 g of ammonia reacts with 4.6 g of oxygen to produce nitrogen gas & water, the limiting reagent is .....
72. An unknown element is a colourless gas. Upon heating with sodium no rx occurs. The family of elements this element belongs is called .....
73. When an acid is reacted with a base what type of compound is formed .....
74. What is the pH of a sol’n which has a hydrogen ion concentration  $= 4.0 \times 10^{-8}$  .....
75. Experimentally determining the concentration of an unknown sol’n by comparing it to the conc’n of a known standard sol’n is called .....
76. Which laboratory apparatus measures volume most accurately.....; least accurately.....
77. 10.0 g of sodium hydroxide are dissolved in 250 mL of water, what is the  $[\text{NaOH}]$  ? ..... the pH = .....
78. What mass of potassium hydroxide is required to make 500 mL of 0.4 M sol’n ?.....
79. 23.3 g of magnesium nitrite is dissolved in 800 mL of water, what is the  $[\text{nitrite ions}]$  ?.....
80. How many grams of sodium hydroxide would be required to neutralize 189 g of acetic acid acid ? .....

81. A solution with BromThymol Blue in it is yellow; the pH must be .....
82. What volume of 18 M **stock**  $\text{H}_2\text{SO}_4$  is required to make 2 L of 0.8 M  $\text{H}_2\text{SO}_4$  .....
83. 300 mL of water are added to 500 mL of 1.6 M  $\text{Ca}(\text{NO}_3)_2$ . What is the  $[\text{Ca}^{2+}]$ ? .....  $[\text{NO}_3^-]$  .....
84. Write the 4 equations of  $n =$  .....  $n =$  ..... ,  $n =$  ..... ,  $n =$  .....
85. 6 g of 2,2-dimethylpropane are burned under 400 mL of water initially @ 20°C. The water temp rose to 46°C. Write the thermochemical equation for this reaction.
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1. Calculate the % **sulfur** in sodium thiosulfate pentahydrate (  $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$  )
2. A **3.32 g** sample of terephthalic acid is analyzed and found to contain **1.92 g** of carbon, **0.12 g** of hydrogen and the rest oxygen.  
 a) calculate the %C, %H & %O in this compound  
 b) Calculate the **simplest formula** of terephthalic acid  
 c) A titration was done to find the molar mass of this acid. **16.6 g** of the acid were exactly neutralized by **200 mL** of a **0.5 M NaOH** sol'n. Calculate the **molar mass** of terephthalic acid and thence the **actual molecular formula** of terephthalic acid
3. For each molecule, draw the Lewis dot diag, structural formula, shape, bond angles & polarity i) HCN ii)  $\text{CHCl}_3$  iii) HCHO iv)  $\text{H}_2\text{S}$   
 b) Draw i) 4,5,6-trichloro-trans-2-cyclobutyl-3-ethyl-2-hexene ii) 4-nitro-2,2,3-trimethyl-3-pentanol
4. **29.5 g** of an unknown gas at **960 kPa** and **40° C** was found to occupy a volume of **400 mL**. Find the molar mass of this gas. This gas is a brominated hydrocarbon with 3 carbon atoms – sketch this gas and name it
- 5 a) Determine the limiting reactant based on the given masses for the following reaction  

$$2 \text{KMnO}_4 + 5 \text{H}_2\text{C}_2\text{O}_4 + 3 \text{H}_2\text{SO}_4 \rightarrow \text{K}_2\text{SO}_4 + 2 \text{MnSO}_4 + 10 \text{CO}_2 + 8 \text{H}_2\text{O}$$
 i) 100 g  $\text{KMnO}_4$ , 100 g  $\text{H}_2\text{C}_2\text{O}_4$ , excess  $\text{H}_2\text{SO}_4$   
 ii) 40 g  $\text{KMnO}_4$ , 70 g  $\text{H}_2\text{C}_2\text{O}_4$ , 35 g  $\text{H}_2\text{SO}_4$
- b) A **100 g** chunk of magnesium is reacted with **58 L** of  $\text{O}_2$  gas @ **25° C** & **100 kPa**. Calculate the mass of product that should be produced. If **152 g** of product actually was produced, what is the % **yield** for this experiment?
6. **16 g** of calcium bicarbonate are reacted with excess HCl, what volume of  $\text{CO}_2$  gas @ **23° C** & **90 kPa** is produced?
7. **10.7 g** of  $\text{NH}_4\text{Cl}$  are reacted with excess  $\text{Ca}(\text{OH})_2$  what volume of  $\text{NH}_3$  gas @ **26° C** & **98.4 kPa** is produced?
8. A sample of magnesium sulfate **hydrate** with a mass of **2.465 g** was heated to produce **1.204 g** of the anhydrous salt magnesium sulfate. Determine the formula of this hydrated salt (ie the value of **X**)
9. **3.8 g** of **impure** stock **NaOH** are dissolved in **250 mL** of distilled water.  
 \*\*20 mL samples of this **base** were **titrated** against **0.15 M  $\text{HNO}_3$**  and the following data were collected and recorded :
- |                       | <u>Rough titration</u> | <u>Titration #1</u> | <u>Titration #2</u> |
|-----------------------|------------------------|---------------------|---------------------|
| initial buret reading | 1.6 mL                 | 4.8 mL              | 0.4 mL              |
| final buret reading   | 24.5 mL                | 27.2 mL             | 22.8 mL             |
- a) From the **titration data**\*\* calculate the "true" **concentration** of the NaOH sol'n **then**  
 b) Calculate the **mass** of **pure NaOH** that must have been in the sample **then**  
 c) Calculate the % **purity** of this impure NaOH reagent
10. A new compound "**Louic acid**" is discovered at the St.Brian Laboratories Inc. It was known to be an **oxy acid** containing one of the **halogens** .  
 \*i) A stock base solution was made by dissolving **4.0 g of NaOH** in **500 mL of water**.  
 ii) A solution of the acid was made by dissolving **4.1 g** of acid in **250 mL of  $\text{H}_2\text{O}$** .  
 \*\*iii) **SOME** of this **acidic solution** ( **25 mL** ) was titrated against the base ( NaOH ) producing the following results:
- |                       | <u>Rough titration</u> | <u>Titration #1</u> | <u>Titration #2</u> |
|-----------------------|------------------------|---------------------|---------------------|
| initial buret reading | 0.10 mL base           | 20.10 mL            | 16.49 mL            |
| final buret reading   | 20.10 mL               | 38.26 mL            | 34.56 mL            |
- a) From the **data**\* calculate the **concentration** of the base solution you made.  
 b) Using the **titration data**\*\* calculate the **concentration** of the unknown acid sol'n then the **molar mass** of the acid and then **identify** Louic acid by **name & formula**.

11. Complete & balance the following reaction equations

A) A chunk of **sodium** is dropped into a cup of **water**.

B) Some  $\text{C}_9\text{H}_{18}\text{N}_2\text{S}$  is *burned* in excess **oxygen**.

C) Some **pentene** is *burned* in reduced **oxygen**.

D) A solution of **ammonium phosphate** is added to a solution of **copper(II) sulfate**.

E) A hydrated salt, **magnesium sulfate heptahydrate**, is heated vigorously over a burner.

F) **potassium chlorate** is heated in the presence of a small quantity of manganese dioxide ( $\text{MnO}_2$ )

G) A solution of **platinum(III) nitrate** is stirred with a **zinc**-plated spoon.

H) A piece of **magnesium** is left overnight in a solution of **acetic acid**

I)  $\text{H}_3\text{PO}_3$  +  $\text{NH}_4\text{OH}$  → .....

J)  $\text{CaCO}_3$  (s) +  $\text{H}_3\text{PO}_4$  → .....

K)  $\text{H}_2\text{SO}_4$  + ..... →  $\text{H}_2$  (g) + .....

L) Cu (s) +  $\text{H}_2\text{O}$  → .....

M)  $\text{SO}_2$  (g) +  $\text{H}_2\text{O}$  → .....

N) Al (s) +  $\text{Cu}(\text{NO}_3)_2$  → .....

O) + →  $\text{Fe}_3\text{O}_4$

P)  $\text{NH}_4\text{Br}$  (s) +  $\text{Ca}(\text{OH})_2$  → .....

Q)  $\text{AgNO}_3$  (aq) +  $\text{CaCl}_2$  (aq) → .....

R) ..... + ..... →  $\text{Mg}(\text{NO}_3)_2$  +

S) ..... + ..... →  $\text{Mg}(\text{NO}_3)_2$  +

T) ..... + ..... →  $\text{Mg}(\text{NO}_3)_2$  +

be sure Q,R&S  
are different  
reaction types